IS AN ANXIOUS SUPPORT PROVIDER AN EFFECTIVE ONE?

SOCIAL SUPPORT PROVIDER ANXIETY AND

CARDIOVASCULAR FUNCTION

by

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STATEMENT OF THESIS APPROVAL

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ABSTRACT

Social support has important and reliable links to physical health. The association of perceived social support with health is particularly well understood, and is consistently found in the research literature. Received social support, however, is less reliably linked to health outcomes, and laboratory studies manipulating received support often find it results in heightened physiological reactivity and distress. One factor thought to influence the effectiveness of received social support is anxiety on the part of the social support provider. The present study examined the main and interaction effects of social support provider anxiety and support role within participant dyads (provider, receiver) on reactivity to a laboratory support transaction. One hundred and forty-eight participants were assigned to a support role within a dyad, and each dyad was randomized to either a low provider anxiety condition, or to a condition in which heightened provider anxiety was induced with a social evaluation manipulation. Participants completed measures of self-esteem, state and trait anxiety, perceived threat and coping ability, as well as measures of dominance, valence, and arousal. Cardiovascular reactivity was assessed via blood pressure and impedance cardiography. Results supported the hypothesis that social support provider anxiety resulted in less effective social support, and also indicated health costs of providing support under nonoptimal conditions.

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INTRODUCTION

A considerable body of research has linked social support to physical health (Berkman, Glass, Brissette, & Seeman, 2000; Cohen, 1988; Holt-Lunstad, Smith, & Layton, 2010; Uchino, 2004). In a recent meta-analysis, greater social support was associated with reduced risk of mortality (Holt-Lunstad et al., 2010). The magnitude of this relationship was comparable to the effect of smoking cessation, and even exceeded many conventional risk factors such as physical inactivity and obesity. The effects of greater perceived social support on better health was also evident across gender, age, initial health status, and cause of death.

Despite the evidence linking social support to health, not all aspects of support appear to have consistently beneficial influences on health outcomes. Received social support (the actual support given to an individual by others), has been less consistently linked with positive outcomes in the larger literature examining mental and physical health (Barrera, 1986). For instance, in a 7-year follow-up study examining the effects of social support in older adults, integration into a large social network was positively associated with survival, but this effect was not consistent for received social support—individuals receiving instrumental support experienced greater mortality than those not receiving such assistance (Forster & Stoller, 1992). In fact, as many as half the studies exploring received support found it to be linked to increased mortality rates, though the precise

reasons for such associations remain unknown (Uchino, 2004). This inconsistent link was confirmed in the recent meta-analysis in which received support was the one aspect of support that was not significantly associated with mortality rates (Holt-Lunstad et al., 2010).

These epidemiological data are also consistent with a growing body of studies examining whether receiving support in the laboratory can buffer cardiovascular reactivity during stress (i.e., buffering model; Cohen & Wills, 1985; Glynn, Christenfeld, & Gerin, 1999; O'Donovan & Hughes, 2008). These lab-based studies are grounded in the reactivity hypothesis, wherein repeated exposure to stressors produces a strain on the cardiovascular system in the form of increased or protracted reactivity. Over time, the combined effects of this repeated acute stress reactivity appear to be associated with greater risk of cardiovascular disease (Chida & Steptoe, 2010). Importantly, although there is some evidence in these lab-based studies consistent with the buffering model of support, there is also significant variability in and important moderators of such links (Thorsteinsson & James, 1999). These findings are in line with more recent research demonstrating the inconsistent effect of received social support on reactivity in laboratory settings (Uchino, Carlisle, Birmingham, & Vaughn, 2011).

Several explanations for the inconsistent relationship involving received support have been proposed based on stressor, recipient, and provider-related factors (Uchino, 2009). For instance, one model suggests that those with greater received support are engaged in more support seeking than individuals who report less received support. This increased support seeking is thought to derive from

greater initial stress (Barrera, 1986). However, Seidman, Shrout, and Bolger (2006) conducted simulation studies to test this potential explanation and their findings suggested received social support appears to have a direct (not spurious) negative impact on the recipient. Another line of research focusing on recipient-related factors suggests that receiving unsolicited support can result in a decrease in self-esteem (Bolger & Amarel, 2007; Bolger, Zuckerman, & Kessler, 2000), which may be associated with negative outcomes, though this has not been explored in health studies (Uchino, 2009). These findings highlight the importance of understanding the context in which social support is received.

An important class of contextual factors that has not received sufficient attention in this literature is the role of provider characteristics. One such factor that has been hypothesized to influence support but that has received virtually no attention is support provider anxiety. In their paper *Social Support for Bereavement,* Lehman, Ellard, and Wortman (1986) suggested that anxiety experienced by the provider of social support may interfere with the effectiveness of received support, perhaps "resulting in support attempts that are automatic or ritualized…" (p. 443). Emotional confounding from anxiety may result in 'miscarried helping,' wherein genuine attempts to provide support are counterproductive (Coyne, Wortman, & Lehman, 1988). While provider anxiety has been hypothesized to be a factor in the effects of received social support, there is virtually no research directly investigating the possibility. Existing research (e.g., Iida, Seidman, Shrout, Fujita, & Bolger, 2008) examines whether negative mood impacts whether social support is provided, but not how anxiety influences the nature and effectiveness of provided support, to say

nothing of its possible links to cardiovascular reactivity and long-term health outcomes.

The role of provider anxiety on received support is important because a broader literature has linked anxiety with performance deficits across domains. State anxiety has been linked to decreased accuracy, efficiency, and performance in sports participation and physical activity (Englert & Bertrams, 2012; Horikawa & Yagi, 2012; Nibbeling, Oudejans, & Daanen, 2012). In musicians, higher cognitive anxiety has been associated with decreased technical accuracy during performance (Yoshie, Shigemasu, Kudo, & Ohtsuki, 2009). Anxiety is linked to increased procrastination, as well as less effort and time spent on learning (Macher, Paechter, Papousek, & Ruggeri, 2012). The negative effects of anxiety on academic performance have been found to extend beyond immediate assessment to more distal outcomes, such as grade point average (Eum & Rice, 2011). Research in clinical populations also indicates that chronically anxious individuals tend to exhibit social impairment, maladaptive social skills, and difficulty forming relationships (Beidel, Turner, & Morris, 1999; Turner, Beidel, Dancu, & Keys, 1986). The detrimental influence of anxiety on these outcomes are thought to be mediated by central executive processes (Owens, Stevenson, Hadwin, & Norgate, 2012). By extension, this may suggest that anxious social support providers may be too distracted by worrying or self-focused attention to notice cues from the support recipient, leading to less effective, or even detrimental, received support (Clark & Wells, 1995; Lehman et al., 1986).

The present study aimed to investigate the role of provider anxiety on the

effectiveness of received social support in terms of its effect on cardiovascular reactivity. In order to induce anxiety, an evaluative threat manipulation was utilized based on prior work (Cacioppo et al., 1995). A 2 (Evaluative threat: low, high) X 2 (Dyad: support provider, support recipient) mixed design was thus utilized with evaluative threat as a between factor and dyad as a repeated measures factor. To examine possible connections of social support provider anxiety to health-related outcomes, systolic and diastolic blood pressure (SBP, DBP) and heart rate reactivity data were collected, as these physiological outcomes have been associated with long-term disease risk (Chida & Steptoe, 2010). To examine the underlying determinants driving blood pressure and heart rate changes, cardiac output (CO), total peripheral resistance (TPR), pre-ejection period (PEP), and respiratory sinus arrhythmia (RSA) were collected via impedance cardiography (Sherwood et al., 1990; Tomaka, Blascovich, Kibler, & Ernst, 1997). These data were analyzed using Proc Mixed to account for the dependency in the responses of interacting dyads (Campbell & Kashy, 2002).

Hypotheses

A main effect for dyad was predicted such that support recipients would view support providers as higher in dominance and friendliness as measured by the IMI (Trobst, 2000). Support recipients interacting with an anxious provider should view that person as lower in dominance and friendliness, as evidenced by a support provider X dyad interaction. A main effect of evaluative threat was predicted in that participants in the heightened evaluative threat condition would evince greater state anxiety, threat appraisals, lower state self-esteem, and higher blood pressure

reactivity, with these effects possibly being greater in recipients receiving support from a provider in the high evaluative threat condition (i.e., evaluative threat X dyad interaction).

METHOD

Participants and Design

Participants were 148 individuals (78 female, 70 male; see Table 1) compensated financially or with course credit. Inclusion criteria called for good general health free of medical conditions with a cardiac element (e.g, no hypertension or cardiovascular medications. See Cacioppo et al., 1995). Participants were randomly assigned to a 2 (Evaluative threat: low, high) X 2 (Support dyad: provider, recipient; see Table 2) design with evaluative threat as a between-participant factor and dyad as a within-participant factor.

Table 1

Characteristics of Study Participants

Variable	Mean (*SD*) or Percent	
Sex	52.70% female	
Age	22.1149 (4.2945)	
BMI	23.8458 (4.4873)	
Ethnicity	75.34% White	
	13.01% Asian/Pacific Islander	
	7.53% Hispanic/Latino(a)	
	4.09% Other	
Annual Income	52.52%	<$10,000
	24.46%	$10,000-20,000
	23.02%	>$20,000
Education	81.76% Some college/working toward college degree	

Table 2

Study Conditions and Sample Sizes

Provider Anxiety:	Low Threat	Heightened Threat
Male	*n*=34	*n*=36
Female	*n*=40	*n*=38

Procedure

Participation included one laboratory session lasting approximately 90 minutes. Participant treatment was in compliance with APA Ethical Code and University and departmental policies. Informed consent was obtained upon arrival in the lab. Participants were then randomly assigned to either the support provider or support recipient role, and providers within dyads randomly assigned to a low evaluative threat (control) group or heightened evaluative threat condition. To control for potential confounds in mixed gender dyads, support dyads were same-sex matched, enabling a more focused test of the hypothesis. Height and weight were recorded, and participants completed a demographics questionnaire.

A blood pressure cuff (Dinamap Pro100; Critikon Corp.) was attached to the upper (nondominant) arm of each participant to measure heart rate and blood pressure responses during the experimental session. Seven spot-electrodes were placed according to manufacturer and published guidelines (Hoetink et al., 2002; Sherwood et al., 1990). At this point, participants were separated by a partition and asked to relax quietly without speaking to each other for 10 minutes while baseline measures of cardiovascular function were obtained.

Following the physiological baseline measurements, the Threat/Challenge Appraisals, State Anxiety Scale, Trait Anxiety Scale, State Self-Esteem Scale, and Self-Assessment Manikin were obtained from both members of the dyad. After these measures were collected, support providers were taken into another room and given the evaluative threat manipulation based on group assignment. Support recipients remained in another room, and were thus blinded to the manipulation. More specifically, these participants were told:

> "In this study, we will be evaluating your social skills and competence, as measured by the effectiveness of the support you provide to the other participant during their description of a stressful event or problem. Do your best to provide helpful support to the other person, because the main point of this study is to evaluate your social skills. On top of that, the other person will be distressed by discussing their problem, so they'll be relying on you for support. So to summarize, we will watch and listen to you as you provide support, and rate the effectiveness of this important social skill aspect. After the interaction, we will ask the other person to rate how helpful you were and how competent you are in terms of providing support."

Research has demonstrated that such social evaluations are effective manipulators of anxiety and physiological reactivity (Smith, Nealey, Kircher, & Limon, 1997). In the low-evaluative threat (control) condition, providers were simply told to provide support:

> "In this study, you have been assigned to provide support to the other participant during their description of a stressful event or problem, but our interest is strictly on how the other person deals with stress. We don't want you to feel anxious or evaluated at all, because we are only concerned with how the other participant behaves, since they are the one telling the stressful story."

During this time, support recipients were told that they had been assigned to discuss a personal problem with the other person. They were asked to complete a brief scale directing them to list 5 past experiences that were stressful and that they

would feel comfortable discussing as part of the experiment (see Holt-Lunstad, Uchino, Smith, & Hicks, 2007). Support recipients rated these situations/events in terms of importance, positivity, negativity, and stressfulness on a 1 to 5 scale. The experimenter selected an event that was rated as moderately high (reported as a 3) to control for the intensity of the event.

Support providers and recipients then returned to the same room for the support discussion task and were given the appraisal scale. Support recipients were then asked to (a) describe the event, (b) talk about his/her thoughts and feelings regarding this situation/event, and (c) discuss how they handled the situation/event and/or how they might have changed anything for 1 minute each. After each such disclosure point, support providers had 1 minute to provide what they deem to be appropriate support to the other participant, as instructed earlier. The participants thus discussed the event for a total of 6 minutes, with the support recipient and support provider alternating speaking for 1 minute each. During the discussion, the experimenter directed the dyads from a control room. Upon completion of the discussion task, participants were separated by a barrier and cardiovascular activity was measured during a 5-minute recovery period. Participants then completed the State Anxiety Scale, State Self-Esteem Scale, IMI, thought listing, CSIV-32, self- and partner-assessment manikins, postdiscussion rating, and perceptions of support questionnaires, after which the physiological measurement equipment was removed and participants debriefed regarding their participation in the study.

Measures

Cardiovascular assessments. A Mindware 2000D Impedance Cardiograph was used to measure ECG, basal thoracic impedance (Z_0), and the first derivative of the impedance signal (dZ/dt). Seven spot-electrodes were placed according to manufacturer and published guidelines (Hoetink et al., 2002; Sherwood et al., 1990). The cardiographic data were ensemble averaged within 1-minute epochs and each waveform was verified or edited prior to analyses. CO, TPR, PEP, and RSA were scored following standard procedures (Berntson et al., 1997) and averaged across minutes to increase reliability (e.g., Kamarck et al., 1992). A Dinamap Model 100 monitor was used to measure SBP, DBP, and HR (Critikon Corporation, Tampa, Florida). The Dinamap uses the occillometric method to calculate blood pressure. Cardiovascular assessments were obtained via a properly sized occluding cuff positioned on the upper nondominant arm. Mean SBP, DBP, and heart rate were calculated by averaging across each assessment period (i.e., baseline, speech stressor) to increase reliability (Kamarck et al., 1992).

Threat and challenge appraisals. Prior to the discussion task, participants completed a measure of challenge and threat appraisals utilized by Tomaka et al. (1997). Participants were asked to rate on a 6-point Likert scale "how threatening do you expect the task to be" and "how able are you to cope with the task." These assessments have been sensitive to different patterns of cardiovascular reactivity in prior work (e.g., threat with increased TPR, Tomaka et al., 1997).

State-Trait Anxiety Scale. The short-form of the Spielberger State-Trait Anxiety Scale state anxiety subscale was administered to both participants at

baseline and following the discussion task (Marteau & Bekker, 1992). Participants were asked to rate their current feelings on a 1 (not at all) to 4 (very much) point scale. The internal consistency of the scale was high at both assessments (Chronbach's alpha > .82). Following the discussion, participants were asked to rate their partner's state anxiety. To assess global anxiety, the trait anxiety subscale was also administered at baseline (Chronbach's alpha > .93).

State self-esteem. The State Self-esteem Scale (SSES) short form assessed potential group differences (Heatherton & Polivy, 1991) at baseline and following the discussion task. The SSES measures both naturally-occurring and laboratory-based threats, and has sound psychometric properties (Heatherton & Polivy, 1991), and had high internal consistency at both administrations in the present study (Chronbach's alpha > .91). Although the total scale score was examined, the social evaluation subscale was of particular importance as it was predicted to be most sensitive to the relationship-based processes under examination (see Baldwin, 1994).

Impact Message Inventory (IMI). The IMI is an inventory derived from the interpersonal circumplex model and assesses perceptions of another individual's interpersonal behavior along two dimensions: friendliness versus hostility and dominance versus submissiveness (Kiesler et al., 1985; Kiesler, Schmidt, & Wagner, 1997). The IMI in this study consisted of 32-items with 4 items per octant. The IMI has been found to have adequate psychometric properties. In previous studies, it was sensitive to similar interpersonal manipulations (Kiesler et al., 1985; Nealey, Smith, & Uchino, 2002) and to differences between supportive relationships and

more ambivalent, casual acquaintances (Smith, Ruiz, & Uchino, 2004). The IMI was administered following the discussion task, and had high internal consistency (Chronbach's alpha > .80).

Self-Assessment Manikin (SAM). A nonverbal pictorial questionnaire assessed valence, dominance, and arousal in both participants at baseline and following the interaction task. Following the discussion, participants were also asked to evaluate their partner using this measure. The SAM has been shown to correlate highly with longer measures of emotion, and may be better able to track personal responses to affective stimulus (Bradley & Lang, 1994).

Circumplex Scales of Interpersonal Values (32-item short form). Following the discussion, this measure assessed the interpersonal goals each participant held during the interaction. The scale has been shown to have internal and test-retest reliability, as well as convergent and discriminant validity with other interpersonal traits, problems, and motives measures (Locke, 2003), and showed high internal consistency in the present study (Chronbach's alpha > .91).

Thought listing. Following the discussion task, participants were given 2.5 minutes to list thoughts that occurred during the discussion (Brock, 1967). Research staff coded responses for total number of thoughts, as well as for thoughts with positive or negative valence toward the other participant. Interrater reliability was high for positive, negative, and total thoughts (Cohen's kappa > .91).

See Table 3 for a complete timeline of measurement administration.

Table 3

Protocol Timeline

Baseline/Pre	During Discussion	Post
Cardiovascular Reactivity (10 min)	Cardiovascular Reactivity	Cardiovascular Reactivity (5-minute recovery)
Demographics		Thought Listing
		CSIV-32 (Interaction Goals)
State-Trait Anxiety Scale		State Anxiety Subscale
State Self-Esteem		State Self-Esteem
SAM		SAM (+partner)
Anxiety Manipulation		
Threat/Challenge Appraisals		Impact Message Inventory

RESULTS

Preliminary Analyses and Manipulation Checks

During the verification process, impedance data for 15 dyads were excluded from analyses due to equipment malfunction. Data from one blood pressure reading for 1 participant were excluded due to an aberrant systolic blood pressure value of 61, an outlier more than four standard deviations below sample means.

Analyses were conducted using Proc Mixed in SAS to account for the interdependency of dyadic data (Campbell & Kashy, 2002). For the 2 (Evaluative threat: low, high) X 2 (Support dyad: provider, recipient) design, evaluative threat was a between-subjects factor and support dyad was a within-subjects factor. Within each phase of the study (baseline, discussion, recovery), cardiovascular measurements were averaged, and the resulting score from the baseline period was subtracted from the task value to yield a change score.

Data were analyzed for baseline differences across provider evaluative threat levels or support role (provider/recipient). No significant differences emerged for baseline state or trait anxiety, or for self-esteem. Compared to participants randomized to the recipient role, however, those assigned to be providers exhibited higher baseline diastolic blood pressure (4.6513 mmHg, $t(71)=4.07$, $p=.0001$) and lower baseline heart rate (-3.4764 BPM, $t(71)= -2.31$, $p=.0239$). Consequently, all analyses were performed while controlling for baseline levels. In addition, ancillary

analyses on whether participants were speaking or listening found the expected main effect on cardiovascular reactivity indicating greater reactivity while speaking (p-values < .01). However, no significant interactions emerged with any of the experimental conditions so analyses were performed collapsed across listening and speaking to improve measurement reliability (Kamarck et al., 1992).

Our primary manipulation checks included the threat and challenge appraisals—which were collected immediately following the reading of the manipulation script. Compared to participants in the low evaluative threat group, those in the heightened evaluative threat condition reported feeling marginally more threatened by (p=.0829) and significantly less able to cope with (p=.0475) the impending discussion task (see Table 4). Results of the Self-Assessment Manikin also showed greater change in arousal for providers from baseline to posttask measurements, $t(64)=2.8$, p=.0068. State anxiety was assessed prior to the cardiovascular baseline and again at the end of the cardiovascular recovery period. No significant difference in change was detected by this measure, perhaps because it was taken after the recovery period.

Physiological and Psychological Outcomes

We first examined the links between evaluative threat and dyad via cardiovascular assessments. Analyses revealed a significant main effect of evaluative threat on both systolic blood pressure (SBP; $F(1,72)=4.40$, p=.0395) and diastolic blood pressure (DBP; $F(1,72)=9.20$, p=.0034). Pairwise comparisons indicated that dyads in the heightened provider threat condition exhibited greater increases in systolic blood pressure (SBP; $t(72)= 2.10$, p=.0395, 95% CI [.1405,

Table 4

Least Square Means and Standard Errors for Psychological Reactions (Task-Baseline Change)

Provider Anxiety:	Low Threat		Heightened Threat	
	LSM	*SE*	*LSM*	*SE*
State Anxiety	.0011	.0695	-.2140	.0695
State Self-Esteem:				
Social	.0822	.4569	2.1543	.4569
Appearance	.0212	.3238	1.1072	.3238
Performance	.7781	.4012	1.8232	.4012
Self-Assessment Manikin:				
Valence	.1161	.1675	-.1725	.1685
Arousal	.3394	.2195	.4987	.2222
Dominance	.1038	.1857	.3011	.1877

5.5696]) and diastolic blood pressure (DBP; $t(72)= 3.03$, $p=.0034$, 95% CI [1.0444, 5.0484]) (see Table 5, Figures 1 and 2). There were no interactions between evaluative threat to support provider and support dyad, suggesting that the heightened blood pressure reactivity was present across both support providers and recipients.

A significant main effect of dyad was also found for heart rate reactivity, $F(1,70)=6.93$, $p=.0104$. Support providers experienced greater increases in heart rate than support recipients, $t(70)=2.63$, $p=.0104$, 95% CI [.5514, 3.9956]. The interaction of support role (provider/recipient) and evaluative threat was also significant, $F(1,70)=5.46$, $p=.0223$ (see Figure 3). The only significant difference was found for providers in the heightened evaluative threat condition who exhibited the greatest heart rate increases (+13.18 BPM), compared to recipients in the same

Table 5

Least Square Means and Standard Errors for Physiological Reactions (Task-Baseline Change)

Provider Anxiety:	Low Threat		Heightened Threat	
	LSM	*SE*	*LSM*	*SE*
SBP	12.4143	.9657	15.2694	.9593
DBP	8.5859	.7128	11.6323	.7073
HR	10.1977	.7914	11.0543	.7875
CO	.2524	.1946	.3722	.1919
TPR	197.23	96.9776	150.09	96.5084
RSA	-.3339	.1108	-.2311	.1124
PEP	-4.6898	1.8067	-6.6515	1.7858

condition who showed the lowest increases (+8.93 BPM), $t(70)=3.51$, $p=.0008$. No significant effects were found for the impedance-based assessments cardiac output and pre-ejection period. A loss of statistical power (due to the removal of impedance data for 15 dyads) may have prevented the detection of an effect on these measures.

We next examined cardiovascular recovery measures and the change in respiratory sinus arrhythmia (RSA) was significant such that participants in the heightened evaluative threat condition were slower to return toward baseline levels than no threat participants, $F(1,67)=3.88$, $p=.0530$ (see Figure 4). An evaluative threat X support role interaction approached significance, $F(1,47)=3.04$, $p=.0878$, with contrasts showing that support recipients in the high evaluative threat group recovered more slowly than support recipients in the unthreatened provider group, $t(47)=2.60$, $p=.0123$, 95% CI [.0965, .7532].

Analyses of psychological outcomes (all of which controlled for baseline levels) indicated an evaluative threat trend in State Self Esteem Scale change from

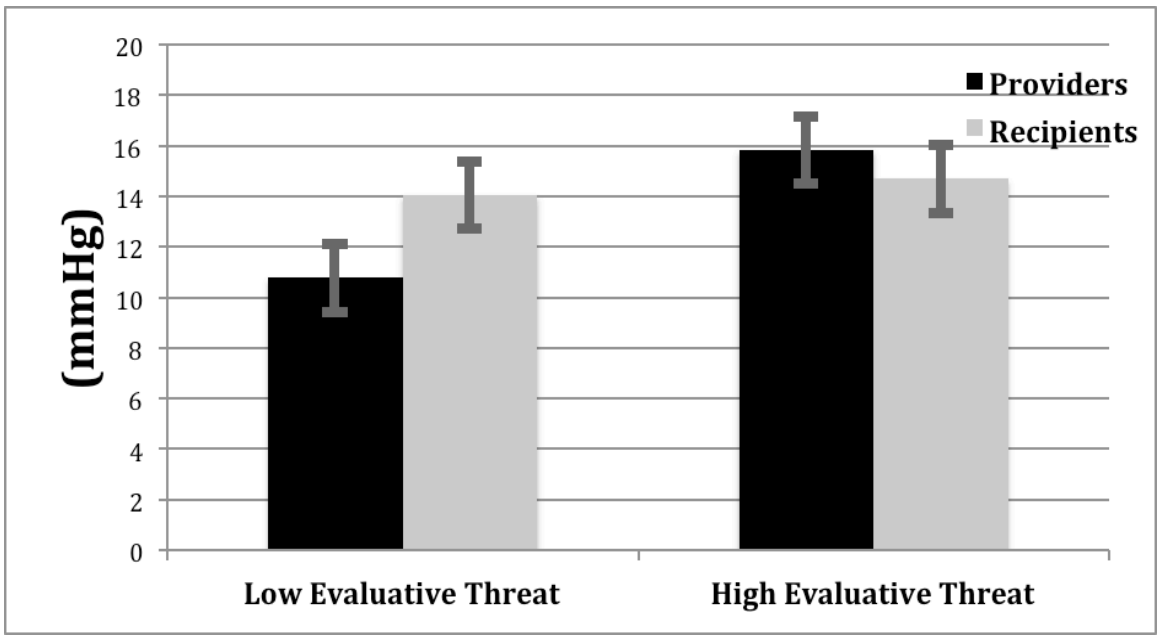

Figure 1. Least Square Means and Standard Errors for Systolic Blood Pressure Reactivity as a Function of Evaluative Threat to Social Support Provider

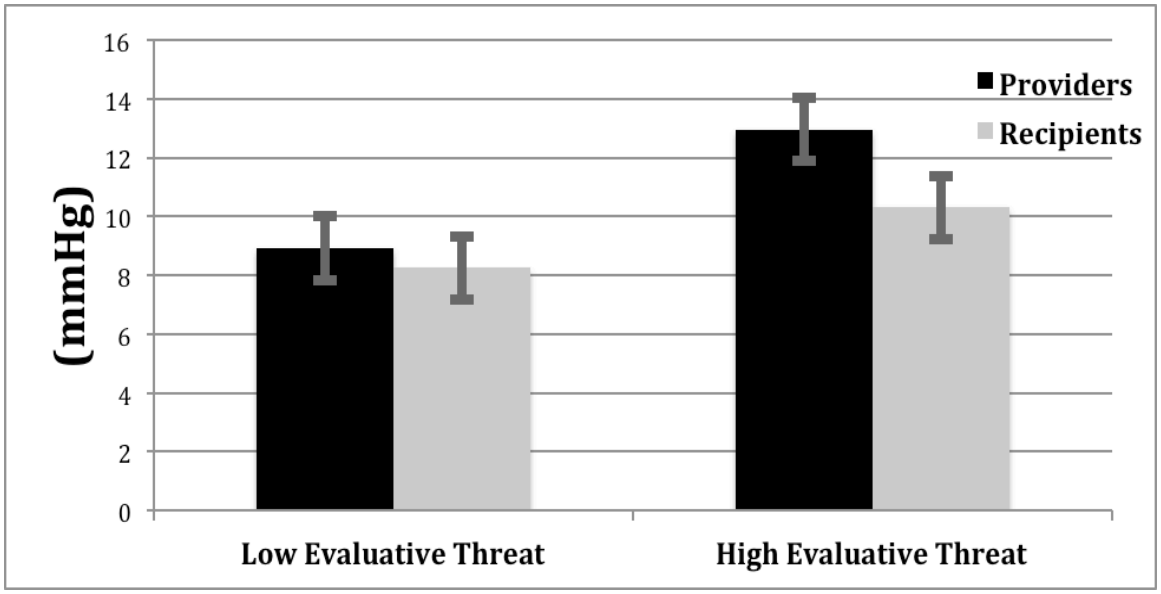

Figure 2. Least Square Means and Standard Errors for Diastolic Blood Pressure Reactivity as a Function of Evaluative Threat to Social Support Provider

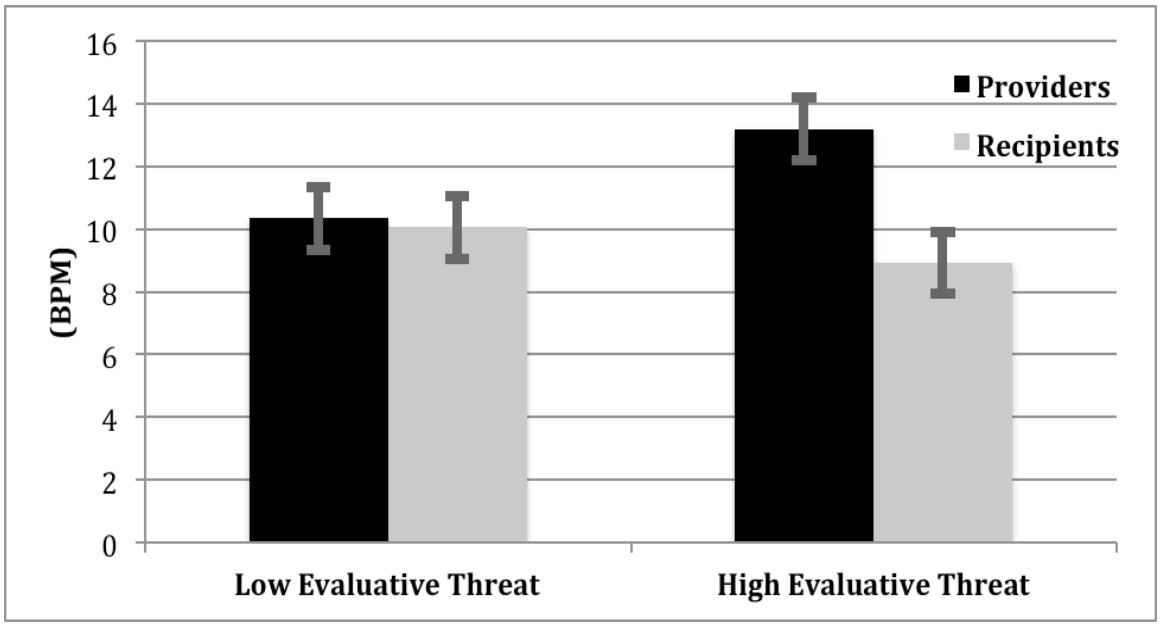

Figure 3. Least Square Means and Standard Errors for Heart Rate Reactivity as a Function of Evaluative Threat to Social Support Provider

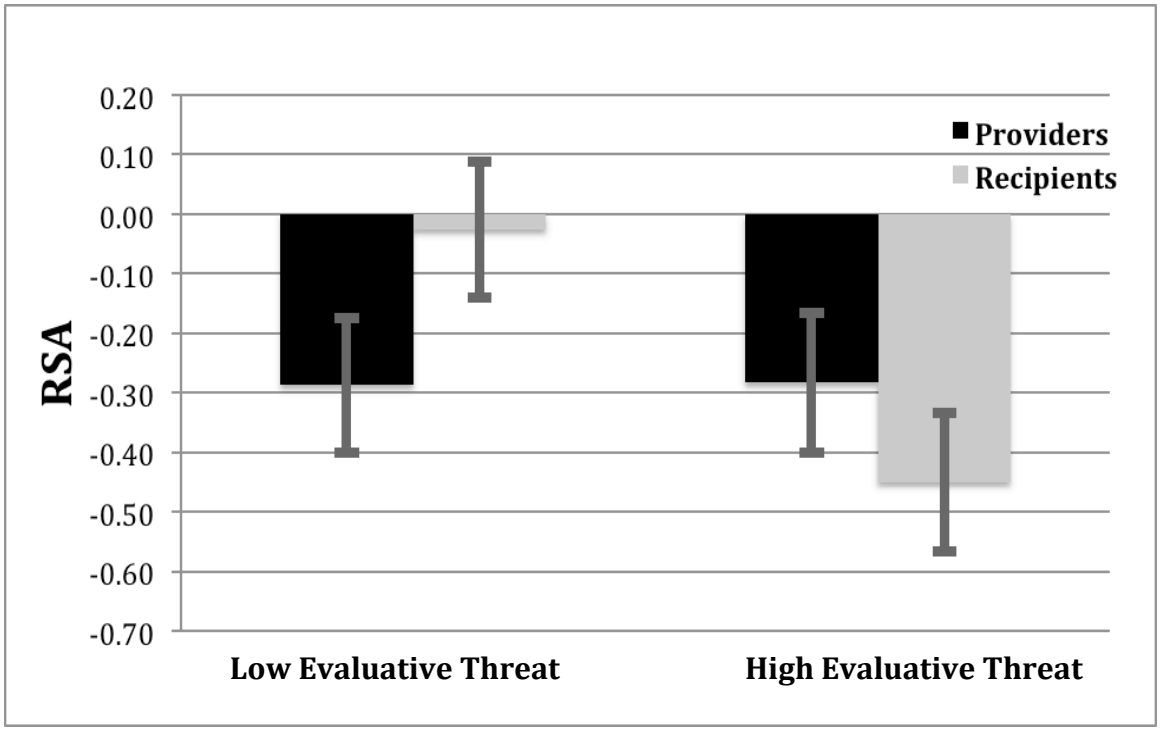

Figure 4. Least Square Means and Standard Errors for RSA recovery as a Function of Evaluative Threat to Social Support Provider

baseline to task. Participants in the heightened evaluative threat condition showed greater declines across the three domains of the measure: social evaluation self-esteem ($F(1,70)=10.20$, $p=.0021$) and appearance self-esteem ($F(1,72)=5.62$, $p=.0204$), as well as a marginally significantly greater decline in performance self-esteem ($F(1,72)=3.39$, $p=.0697$). Further, pairwise comparisons indicated that, among participants in the support recipient role, those in the high evaluative threat group showed greater declines in social evaluation self-esteem ($t(71)= -3.23$, $p=.0019$, 95% CI [-5.1015, -1.2052]) and performance self-esteem ($t(71)= -3.17$, $p=.0023$, 95% CI [-4.0840, -.9278]) than support recipients in the no evaluative threat group.

A significant effect emerged for evaluative threat on participants' ratings of each other on dominance as assessed by the Impact Message Inventory, $F(1,72)=7.46$, $p=.0079$; participants in the high threat condition rated each other lower in dominance than low threat participants, $t(72)=2.73$, $p=.0079$. A significant support role X evaluative threat interaction also showed that providers in the high evaluative threat group were rated less dominant than providers in the no threat group, $t(72)=2.04$, $p=.0447$, 95% CI [.0095, .7792)]. For IMI affiliation (friendliness), there was a significant support dyad main effect, $F(1,72)=11.03$, $p=.0014$, with pairwise comparisons indicating that support providers rated recipients less friendly than recipients rated providers, $t(72)= 3.32$, $p=.0014$, 95% CI [.2915, 1.1666].

DISCUSSION

The primary aim of this study was to examine the impact of social support provider anxiety on the effectiveness of received social support. Consistent with the hypothesis, results showed that when provider anxiety was manipulated via evaluative threat, dyads experienced greater cardiovascular reactivity in both systolic and diastolic blood pressure. Dyads in the heightened evaluative threat condition were also slower than unthreatened provider dyads to return to baseline RSA levels, indicating greater disruption of parasympathetic nervous system activity (Berntson et al., 1997). A pairwise comparison indicated this parasympathetic disruption was greater in support recipients interacting with a high evaluative threat provider than support recipients interacting with an unthreatened provider. Additionally, dyads in the heightened evaluative threat condition reported feeling marginally more threatened by and significantly less able to cope with the discussion task, and showed greater declines in state self-esteem. More specific analyses demonstrated that among support recipients, those receiving support from a provider in the high evaluative threat group showed greater declines in both performance and social evaluation state self-esteem than those receiving support from a provider in the low evaluative threat group. These data converge to provide the first evidence suggesting that social support provider anxiety may result in support transactions that are stressful to both providers and recipients with

detectable effects on both biological and psychological outcomes.

This appears to be the first study demonstrating that anxiety may interfere with the provision of social support on biological outcomes. This may account for the slower RSA recovery in support recipients interacting with providers in the high evaluative threat group—these recipients may not experience the sense of calm or security that support is intended to yield as suggested by polyvagal theory (Porges, 2003, 2009). Similarly, receiving support from an anxious provider could be less helpful the more a support recipient feels they are not the primary focus of the other individual during the support transaction, or that the other individual is not genuinely interested in them or the problem at hand (perhaps linked to the lower self-esteem reported by recipients in the high evaluative threat group). This type of social anxiety is linked to behaviors that may further detract from interpersonal rapport (e.g., avoiding eye contact; Clark & Wells, 1995). In other words, anxiety may introduce interpersonal strain into an otherwise healthy relationship. This may be especially true in closer relationships, and future research should investigate whether the degree of closeness between individuals moderates the effect of anxiety on social support efficacy.

Less consistent with the hypothesis, the predicted main effect of evaluative threat was not found for heart rate reactivity. In addition, support providers in the high threat condition experienced greater heart rate reactivity compared to support recipients. Support recipients in the high threat condition, however, did not show significantly different heart rate reactivity compared to providers and recipients in the low threat condition. Although the precise reason for this pattern is unclear, a

meta-analysis including 36 stress reactivity studies found systolic and diastolic blood pressure to be more predictive of subsequent cardiovascular risk status (e.g., hypertension, left ventricular mass, clinical cardiac events, etc.) than heart rate (Chida & Steptoe, 2010). Thus, despite the pattern found for heart rate reactivity, blood pressure reactivity appears more sensitive to health outcomes, which were the primary focus of this study.

The slower recovery of support recipients in the heightened threat condition to baseline RSA levels may have important implications for health as well. Meta-analytic evidence indicates that delayed cardiovascular recovery is associated with increased cardiovascular risk (e.g., hypertension, coronary calcification, carotid atherosclerotic plaques, etc.; Chida & Steptoe, 2010; Hocking Schuler & O'Brien, 1997). This may be the first study to suggest that support provider anxiety inhibits RSA stress recovery. Research has suggested decreased RSA to correspond with less prefrontal cortical activation, which may impact self-regulatory processes (Thayer, Hansen, Saus-Rose, & Johnsen, 2009). According to social baseline theory (Beckes & Coan, 2011), supportive ties may enhance self-regulatory capacity compared to having to cope with life events on one's own. However, this study suggests that such benefits may not extend to interacting with an anxious support provider, which may deplete a dyad's self-regulatory capacity. Overall, receipt of social support from an anxious provider appears to both heighten cardiovascular reactivity and protract recovery from laboratory stressors. Future research should examine whether this is true in field studies as well. High trait anxiety has been shown to predict higher ambulatory blood pressure (Räikkönen, Matthews, Flory, Owens, & Gump, 1999),

and state anxiety may exert a similar effect, particularly when coupled with the demands of providing support.

These data also suggest that providing support under less then optimal conditions might have negative health consequences. Brown and colleagues (2003) have argued that functioning as a support provider might be more beneficial for one's health compared to receiving support. However, the present results indicate that this may not be true in situations involving high anxiety levels, as support providers under evaluative threat showed relatively high levels of cardiovascular reactivity as well. Future research will be needed to determine if such factors are contributing to discrepancies in findings between the above literature (Brown et al., 2003) and the literature on caregiving for a family member with Alzheimer's Disease that has been linked to negative health effects (Kiecolt-Glaser, Dura, Speicher, Trask, & Glaser, 1991).

In line with hypotheses, participants in the heightened evaluative threat condition rated each other lower in dominance than low threat participants, and pairwise comparisons indicated that support providers in the high threat group were rated as less dominant than providers in the low threat group. This is consistent with cognitive models that contend that anxious individuals engage in 'safety behaviors' intended to shield them from negative social evaluation, but that instead contribute to the very outcomes they are employed to prevent (Clark & Wells, 1995). By engaging in such safety behaviors, anxious social support providers might miss important interpersonal cues from their interaction partners. Additionally, providers may themselves give less feedback. Such decreases in

interpersonal feedback may result in the perception that one or both participants in a social support transaction are not fully engaged in a conversation.

Future research should explore the ways in which social support provided by anxious individuals differs in nature from support given by persons with more typical anxiety levels. One intriguing possibility involves the *matching hypothesis*, which holds that, to be maximally beneficial, social support must take the form that best matches the current needs of the recipient (Cohen & McKay, 1984; Cutrona & Russell, 1990; Cutrona, Shaffer, Wesner, & Gardner, 2007; Horowitz et al., 2001). For example, an individual with an unsolvable problem (e.g., death of a spouse, terminal illness, etc.) is unlikely to appreciate problem-focused support (dating advice or healthy eating tips, for instance). Instead, emotional support in the form of sympathy, compassion, and commiseration seem most appropriate and helpful in this situation. It is possible that the cognitive costs of anxiety result in support type mismatching, as anxious providers might be preoccupied by their own anxiety and its source, and thus fail to respond most appropriately to the needs of the support recipient.

Important limitations of the study should be noted. First, laboratory assessments differ from naturalistic social interactions. Though evidence suggests that lab-based assessments of cardiovascular reactivity have been linked to health outcomes (Chida & Steptoe, 2010), research indicates that elevated ambulatory blood pressure also predicts a variety of cardiovascular health outcomes (Perloff, Sokolow, Cowan, & Juster, 1989; Prisant & Carr, 1990). While the present study examined social support transactions in unacquainted dyads, ambulatory blood

pressure research could examine the effects of support provider anxiety on social support in established relationships. The effects observed in this study might indeed be more pronounced in the context of preexisting relationships given the overlap between self-other representations (Aron, Aron, Tudor, & Nelson, 1991). Finally, this is perhaps the first study examining links between social support provider anxiety and health, so future work modeling such relationships and connecting them to direct health outcomes (e.g., incidence of cardiovascular disease) will be needed. These limitations notwithstanding, this study provides preliminary evidence of the decreased effectiveness of received social support given by providers experiencing evaluative threat. This study also shows the health costs of providing support under nonoptimal conditions.

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